
65xx

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Introduction:

This entry level project has been developed to demonstrate how to work with seven segment displays through the W65C22-VIA port on your W65C02SXB project board. Additionally, this project will show some of the basic functionality and effectiveness of the WDCTools suite using Assembly or C language programing.

With this project you will have an experience that shows you that program things a lot of times can broaden your horizons to see a world of possibilities. Our 65xx technology has been doing this for generations and has been at the forefront of some of the first and most popular computers and gaming systems in the world.

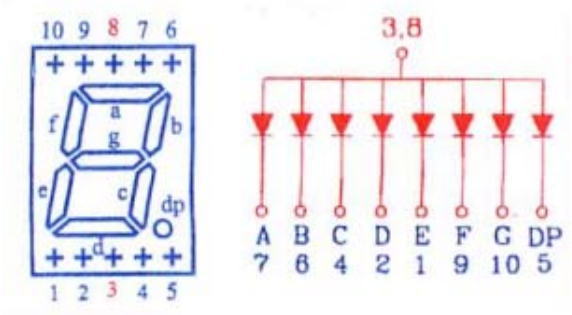
So remember as you begin, this is just the tip of the iceberg of your creativity and success with our technology. By gaining experience and understanding of the relationship to the registers and knowing how the ports work, you will find that it is much like seeing and understanding how Logos fit together. Through this process you are gaining an educational experience with 65xx technology related to real engineering that you cannot get anywhere else. We understand the value of understanding! Many systems have eliminated the need for understanding to acquire a “feeling “of instant gratification. We want you to experience real success.

As your understanding and experience grows you will find that all things are possible. Enjoy!

Step 1-Seven Segment Display:

A seven-segment display (SSD), or seven-segment indicator, is a form of electronic display device for displaying decimal numerals that is an alternative to the more complex dot-matrix displays. Seven-segment displays are widely used in digital clocks, electronic meters, and other electronic devices for displaying numerical information. A seven segment display, as its name indicates, is composed of seven elements. Individually on or off, they can be combined to produce simplified representations of numbers. The seven segments are arranged as a rectangle of two vertical segments on each side with one horizontal segment on the top, middle, and bottom.

There are two types of seven-segment LED displays, Common Anode and Common Cathode. We will be using a common anode display for our project. In common anode displays, all the anodes are tied together and the common anode is connected to the supply voltage Vcc. Individual segments are turned on by applying logic 0 to their cathodes to understand more about the differences between these two displays please visit [www. BasicElectronics-Tutorials.ws.]



Common Anode Seven Segment Layout

The diagram above shows the common anode display from the top with the decimal point down to the right. Pins are numbered from left to right on the bottom, and then from right to left on the top. There are actually two common anode pins (3 and 8), but they are internally connected, so it is sufficient to connect only one. The segments are not attached in order, so a great deal of criss-crossed wiring is required to connect one properly but don't let this discourage you because we have some helpful tips which will help you along the way.

Step 2- Parts and Tools

Parts:

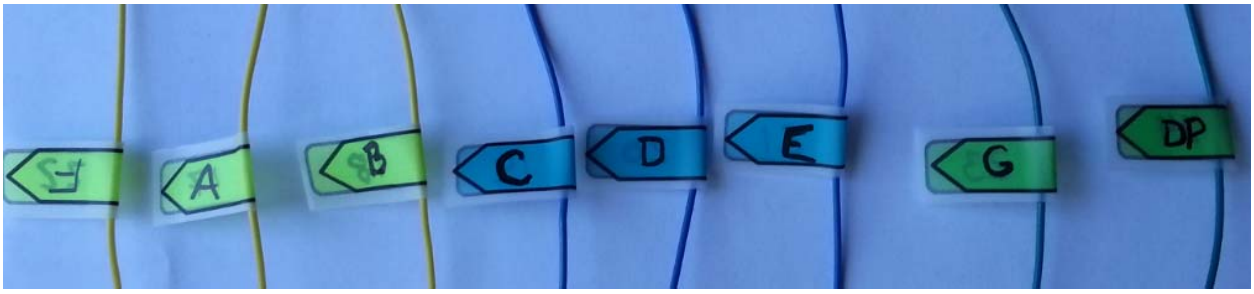
- W65C02SXB Board (available at 65xx.com and WDC Suppliers)
- 1 X Seven Segment Display (Common Anode) – Red or your favorite color
- 1 X 330 ohm resistor
- Male to Female jumper wires

Tools:

- WDC Tool Suite (available at 65xx.com)
- USB microB Cable
- 65xxCoding E-Book (available at 65xx.com)

Helpful Hint:

- Post-it flags can be used to mark your wires with pin and segment ID



Step 3- Building the Circuit

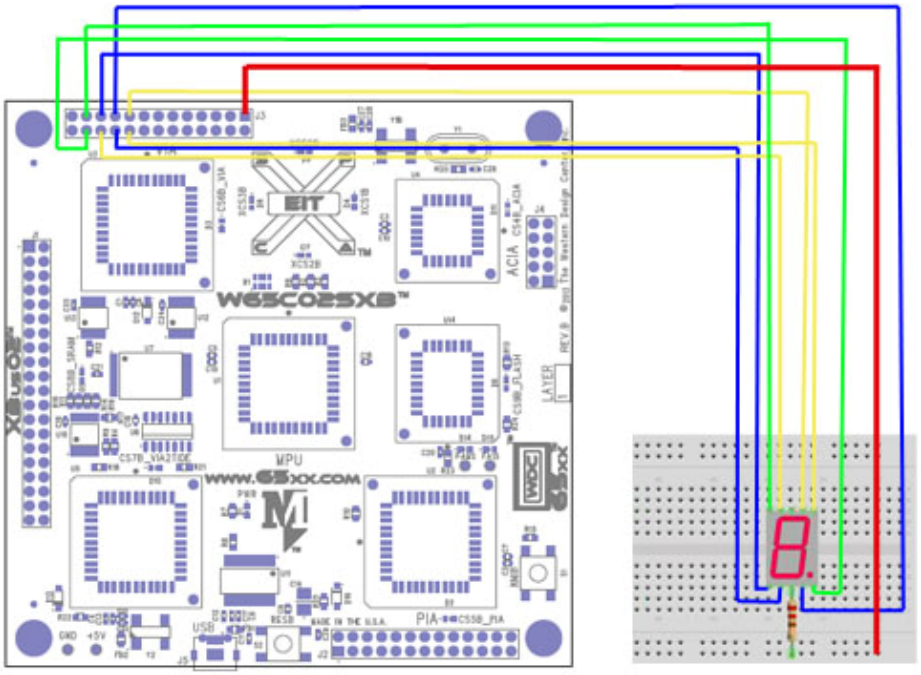
The circuit is pretty straight forward for connecting the common Anode display to the W65C02SXB.

1. Connect a 330 ohm resistor from pin (3/8) on your display to power on your breadboard.
2. Connect jumper wire from VIA port pins to display segment as follow:

A. = Pin 17
B. = Pin 18
C. = Pin 19
D. = Pin 20
E. = Pin 21
F. = Pin 22
G. = Pin 23

DP. = Pin 24

Power = Pin 1



3. Connect W65C02SXB board to computer via USB microB cable
4. Launch TIDE for WDCTools
5. Run W65C02SXB/Project/SevenSegProject.asm

Step 4- Display and Pin Connection Testing

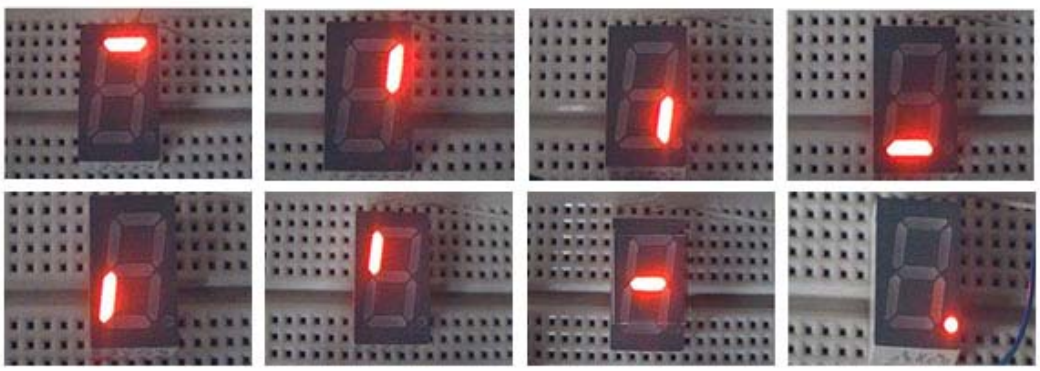
Now that your circuit is complete you can connect your USB cable from the W65C02SXB (Xcelr8r board) to your computer and launch TIDE.

- Open Project through the shortcut key in the toolbar or through the File menu.
- Access the WDC folder in your (C:)Drive and you can find the SevenSeg project in the W65C02SXB projects folder. (C:\WDC\W65C02SXB\Projects\SevenSegProject)

You will notice that the project starts with a LED verification program, prior to running the (W65C02.) code project. This project also has some helpful information in the notes as seen in below.

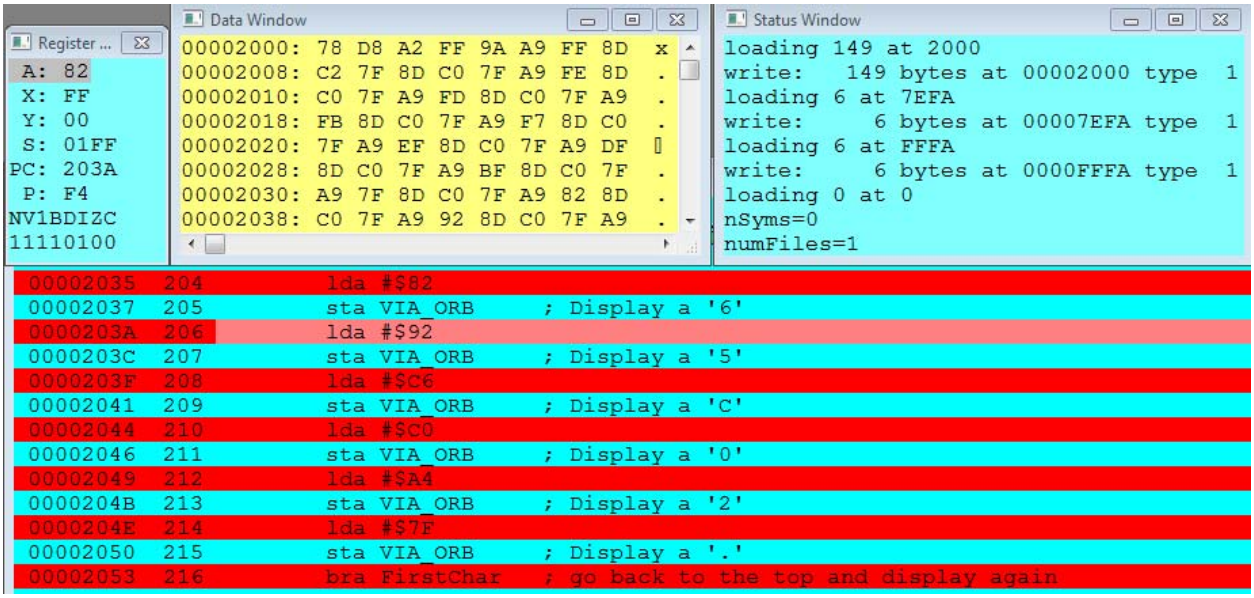
```
167 ;    +    0    +
168 ;    5         1
169 ;    +    6    +
170 ;    4         2
171 ;    +    3    +    7
172 ;
173 ;Example code to make a "6" on the LED with the W65C22S Port B
174 ;This assumes Port B has already been made all outputs
175 ;       lda #$82            ; 10000010  - All segments with a '0' light up
```

```
          183 ; Now we will verify LED segments and pin connection
          184 SegTest:
0000200D  185         lda #$FE
0000200F  186         sta VIA_ORB     ; Display a 'Top Center LED VIA_PB0/Pin 17 seg(A)'
00002012  187         lda #$FD
00002014  188         sta VIA_ORB     ; Display a 'Top Right LED VIA_PB1/Pin 18 seg (B)'
00002017  189         lda #$FB
00002019  190         sta VIA_ORB     ; Display a 'Bottom Right VIA_PB2/Pin 19 seg (C)'
0000201C  191         lda #$F7
0000201E  192         sta VIA_ORB     ; Display a 'Bottom Center VIA_PB3/Pin 20 seg(D)'
00002021  193         lda #$EF
00002023  194         sta VIA_ORB     ; Display a 'Bottom Left VIA_PB4/Pin 21 seg (E)'
00002026  195         lda #$DF
00002028  196         sta VIA_ORB     ; Display a 'Top Left VIA_PB5/Pin 22 seg (F)'
0000202B  197         lda #$BF
0000202D  198         sta VIA_ORB     ; Display a 'Center VIA_PB6/Pin 23 seg (G)'
00002030  199         lda #$7F
00002032  200         sta VIA_ORB     ; Display a '.DP VIA_PB7/Pin 24 seg (DP)'
```



Step5- 65C02. Project

Now that your testing and verification of the circuit are complete and all corrections are made if any are required it's time to run your standard project. Below you will see the project code along with the Register, Data, and Status windows within the debugger. For more information on the functionality of the WDCTools debugger please visit our documentations page at 65xx.com.



Note: This project will continue to loop back rather than running the LED test. To run the LED test again you will have to access the **RUN** menu dropdown and select **Restart**.

Now you are ready to make your own project! You can view the TIDE user guide to see written instruction on how to create a new project or see the WDC Youtube Channel for video assistance.